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Huismans, S.E.; van Schuur, H.

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Taking Advantage of the Circular Structure of Human Values

Sipko E. Huismans, *Vrije Universiteit, The Netherlands,* s.huismans@kpnplanet.nl

Wijbrandt H. van Schuur, *University of Groningen, The Netherlands*

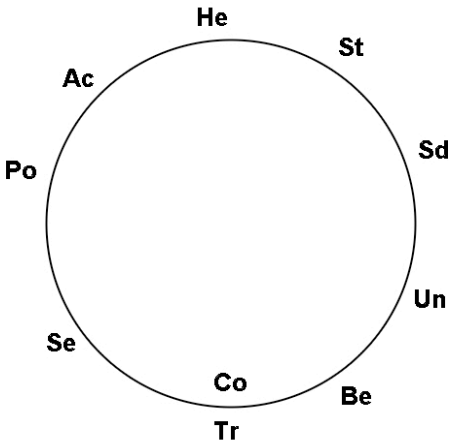
Schwartz (1992) has shown that Value Domains have a circular structure. The same circular structure has been observed in so many samples all over the world that we may assume that the circular structure is rather universal. Given this structure, the Value systems of individuals can be fruitfully characterized using only one score, which enables us to describe it extremely economically. The Value Circle score we suggest might be independent of response tendencies and cross culturally valid as well. The purpose of this chapter is (a) to show how such a score can be assigned to individuals and (b) to show the advantages and possibilities we have using such a score for analyzing the relation between religiosity and values.

As long as it was tried to measure Human Values it was asserted that not the absolute importance of values but their relative importance should be assessed (Vernon & Allport, 1931). Values by definition are rated highly by the large majority of people in a society or cultural group. To assess values in a sensible way it should be crucial to assess the priorities or relative importance people assign to values. Therefore all well known value scales have concentrated on ranking Values. The for the last decennia most influential scientist in this area, Milton Rokeach (1973) has chosen to base his scales on a very complex ranking process.

A consequence of that decision was that the data generated by these scales were psychometrically very problematic. The decision to rank values hindered to find stable and interpretable structures in the values. Only after Schwartz (1992) decided not to rank but to rate values he was able to find interpretable structures in the values. He was able to discern 10 Value Domains: clusters of values sharing the same motivational base. Furthermore he was able to show that the Value Domains could be ordered in a circle. Schwartz (1992) circle of Value Domains is shown in Figure 1. The Value Circle was repeatedly shown to be cross culturally valid. Schwartz's Value Circle was derived through WSSA (Weighted Smallest Space Analysis) a module of the HUDAP (Hebrew University Data Analysis Package) statistical package (Guttman, 1968; Lingoes, 1981) by analyzing ordinal distances between values (an approach similar to the non-metric multidimensional scaling one, although the distances computed were based on Pearson correlations between ratings given to the values in the Value List assessed).

In this chapter we propose to use the Value Circle to assign scores in respect to an overall Value system combining Schwartz's Value Circle with statistically innovative techniques on locating people along the circumference of a circle. One basis of our proposal is our interpretation of the Value Circle that one may expect: in a sample deviations in respondents' ratings from the value mean will be more or less in the same direction if these values are located in the same Value Domain. For instance values "Comfortable life" and "Pleasure" will elicit similar deviations from the means of these two values for a respondent, being both parts of the Domain Hedonism. This interpretation is consistent with the fact that Schwartz analyzed Pearson correlations. The essential part of that correlational approach is the sum of products of deviations from the mean. A Pearson correlation is higher as more deviations from the mean in a sample go together (Huismans & Van Schuur, 2003).

A second interpretation of the Value circle which will be emphasized in this chapter is that the place of a person on the circumference of the Value circle is the crucial information describing an important aspect of that persons whole value system. One score might summarize the crucial information in all ratings of a respondent on the 58 values scale.



Note: For the explanations of the symbols, see table 1. The Value domains Conformity (Co) and Tradition (Tr) are located at the same position on the circumference of the circle but at different distances from the center of the circle.

Values belonging to Value Domains located near each other in the circle will elicit more or less the same deviations among the respondents in a sample. For instance the values 'Pleasure' and 'Exciting life', located in the neighbouring Hedonism and the Stimulation domains, would elicit similar deviations from their means. But values located in Value Domains at opposite positions of the Value Circle would elicit deviations quite different, maybe even opposite from each other.

Figure 1. The Schwartz circular Value Structure as determined by the HUDAP software.

The score we hereby propose is computed through the profiles of 10 deviation scores, for each Value Domain a '0' or '1'.The score '1' is given if the respondent rates that Value Domain above the mean rating of the sample, the score '0' if the respondent rates it below the mean. From the fact that it is possible to locate respondents on a circle follows directly that many possible profiles of Value Domain scores are not admissible. For instance it is not admissible that respondents will have scores of "1" at opposite locations in the circle. Based on the fact that many profiles are not admissible, the second author has designed a method which, by systematically analyzing all profiles, finds the circle of Value Domains minimizing the number of not admissible profiles. The method has been formalized in the computer program CIRCUS (CIRCUmplex Scale analysis) designed by the same author. CIRCUS suggests the circular order which minimizes the number of not admissible score profiles. (For a more detailed description of the method see Mokken, Van Schuur & Leeferink, 2001; Meijer & Van Schuur, 2003). The method of scoring of a subject's Value Domain profile is based on a nonparametric circumplex model (for theory and a range of applications of the circumplex model see Tracey, 2000) developed by Van Schuur that can best be regarded as an extension of the Mokken (1971) model (the probabilistic nonparametric version of the Guttman scale), and its extension to distance related data for the analysis of preference and development, the nonparametric version of one-dimensional unfolding analysis (Coombs 1964; Van Schuur 1984, 1993). The model assumes a single circular latent continuum (another example can be found in Sidiropoulou-Dimakakou, Mylonas, & Argyropoulou, 2008), on which items and subjects are represented by a single parameter (Leeferink 1997; Mokken, van Schuur & Leeferink, 2001; Huismans & Van Schuur 2003). The software is also capable of assessing the quality of a circle based on a priori order of variables.

After finding the circular order in Value Domains, a Value Circle score can be assigned to respondents. As soon as the Value Domains are ordered in a circle we are in a position to give the Value Domains a number based on the place the Value Domain has on the circle. Because CIRCUS

only determines the order of the Value Domains along the circle, any number that preserves the order of Value Domains is defensible, because no natural origin exists. We have chosen to assign the 10 Value Domains the rankings 1, 3, 5….19, beginning with the Value Domain of "Power". The score of a respondent on the Value Circle is determined by calculating the median score of the value domains selected by a respondent. We used the median because the scores assigned to the values are ordinal. A profile 0 0 0 1 1 1 0 0 0 0 means that positive deviations are found in the Value Domains 7, 9 and 11. The median is thus nine. Also profile 0 0 1 0 1 1 0 0 0 0 and 0 0 1 1 1 1 1 0 0 0 would get a nine. Note that the profile 1 0 0 0 0 0 0 0 0 1 would get the score zero because it is located on a circle. In the method paragraph we refer to the exact algorithm applied.

Firstly we address the question to what degree it is possible to assign scores to Value patterns in the way described above. It is quite possible that many people will get no score at all using our algorithm. Secondly, we decided to relate these scores to subjective religiosity of respondents. We used religiosity for two reasons. Firstly religiosity is a central variable in the area of Values and secondly Schwartz & Huismans (1995) showed what the relation was between subjective religiosity and values. The hypotheses tested in this chapter were based on the fact that Value Domains were located in a circular order. We showed that subjective religiosity was most positively related with Traditional Values and most negatively with Hedonism Values. Furthermore, we expected that the pattern of correlations would take a sinusoid form: decreasing in size from Power values to the Hedonism Values, then increasing in size to Traditional values and then again decreasing to Power values. In the Schwartz and Huismans paper we presented data fully consistent with the above hypothesis. However a statistical test for the hypothesis was not available at that time.

The answer to the second question is '*Quod Erat Demonstrandum*'. If we are able to show sensible relations between the Value Circle scores and other variables, we possess a promising tool that deserves to be improved in further research.

Method

Values were assessed in a sample of 267 first year students in Psychology and Educational Science through Schwartz' Value Survey. Respondents were asked to rate 58 values on a scale varying from minus 1 (against my principles) to 7 (extremely important). All values were presented in the standard order, but we added "SEXUALITY (a satisfying sexual life)" as value 31 and at the end "SELF INDULGENCE (do nice things)" as value 58. The added values were suggested by Schwartz (personal communication) to extend the Hedonism Domain. In this chapter we use the means of the ratings of Values in each of the 10 Value Domains as defined by Schwartz. (Table 1). Because the α coefficient assumptions are violated they are not reported here.

The Value Circle Scores were computed as follows: The basic problem for the construction of the Value Circle Score was that we have no real starting point. We needed an indication of the center of the area where a respondent's most important values are located. This place should be located opposite to the place where the relatively unimportant Value Domains for this respondent would be found.

If we did not find such an area, we would search for an area where the important values are located. The algorithm was defined in six steps described below: (See also Table 2 for examples).

1) First we constructed a profile of Value Domain scores consisting of ten zeros and ones. If a person scored equally or above the mean of a Value Domain, this person was given a "1" otherwise was given a "0" for that Value Domain. The profiles were the actual input for the

program CIRCUS. The output of the program showed that the profiles were consistent with a circle. The solution found is presented in Figure 2. The order of the Values approximates the structure which Schwartz has reported. Because the circle follows exactly the same order as the order used by Schwartz & Huismans (1995), we used this order as the basis for our Value Circle scores. In Figure 2 each Value Domain is connected with a number. Because our method is nonmetric, *any* series of numbers consistent with the order found through the Circus software could be assigned to the Value Domains. We decided to assign number 1 to the "Power" Domain and number 3 to the neighboring Domain "Achievement". This leaves space for number 2, which only implies that a respondent is located between the two Domains. All other figures assigned to the Value Domains are presented in Figure 2.

Table 1. Descriptive statistical indices for the 10 Value Domains

Label	Location	Name	Items[1]	Mean	SD
Po	1	Power	3, 12, 27, 47	1.8	1.2
Ac	3	Achievement	35, 40, 44, 56	3.8	1.0
He	5	Hedonism	4, 31, 51, 58	4.8	1.1
St	7	Stimulation	9, 16, 25, 38, 54	3.6	1.2
Sd	9	Self direction	5, 21, 32, 42	5.0	0.9
Un	11	Universalism	1, 17, 24, 29, 30, 39	3.9	1.0
Be	13	Benevolence	34, 46, 50, 53, 55	4.9	0.8
Tr	15	Tradition	18, 33, 37, 45, 52	2.2	1.1
Co	17	Conformity	11, 20, 41, 48	3.9	1.0
Se	19	Security	8, 13, 22, 57	4.1	1.0

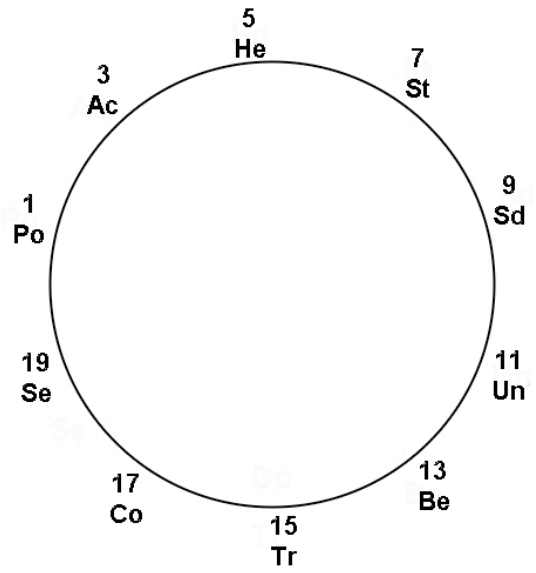


Figure 2. *The circular structure as determined by CIRCUS software*

Table 2. Examples of Value Circle scores

[1] After "31", all value numbers are 1 point higher than in the 56 values version of Schwartz Value List.

Value Label and Location												
Po 1	Ac 3	He 5	St 7	Sd 9	Un 11	Be 13	Tr 15	Co 17	Se 19	**Value Circle Score**	*Comment*
1	1	1	1	0	0	0	0	0	0	**4**	Value 1, 3, 5, 7 are located after a series of six 0's the median is 4, the mean of the middle values.
0	1	1	1	1	1	1	1	1	1	**11**	The longest series of 0 is at value 1. The median of the values after this 0 is 11.
0	0	0	1	1	1	1	0	1	0	**11**	The values 7, 9, 11, 13, 17 are located after a series of four 0's.
1	1	1	1	0	0	1	0	1	1	**1**	The values 13, 17, 19, 1, 3, 5, 7 follow a series of two 0's. Note that here 1 is higher than 19.
1	1	0	1	0	1	1	1	1	1	**17**	No longest series of 0. The longest series of 1's is: 11, 13, 15, 17, 19, 1, 3. The median of this series is 17.
0	1	0	0	0	0	0	0	1	0	**0**	The median 17 and 3 is 0. Both values are located at distance 3 from 0.
1	0	1	0	0	1	1	0	0	1	–	No longest series of 0' s or 1's. The pattern is unscorable. Note value 19 and 1 form a series of 1's.

2) Hereafter, in each of the profiles, the location of the longest series of zeros was identified. This was called the "dominant series of zeros", the region where the Value Domains of a respondent are found to bear relatively low importance for the specific respondent.

3) Starting right after this dominant series of zeros the Value Circle score was defined as the median of the Value Domain Scores with a "1". As a consequence of the fact that scores are located on a circle it could be that low scores are interpreted as higher scores (see example 4 in table 2). If such a region was found, the Value Circle score was assigned to the specific individual and the procedure stopped.

4) Else, if no dominant series of zeros could be found, the dominant series of ones was considered. This was the region where Value Domains of a respondent are found to bear relatively high importance for this respondent.

5) When such a series was found, the Value Circle Score was defined for this individual as the median of the Value Domains in this series of dominant ones.

6) Else if neither a dominant series of zeroes nor a dominant series of ones was found, no Value Circle Score was assigned to the individual. The value pattern was considered not admissible and thus unscorable.

Finally, *Religiosity* was assessed by a single question: to what degree do you consider yourself to be a religious person". The answering scale varied from 0 (not at all) to 7 (very religious). It has been shown (Schwartz & Huismans, 1995) that this one question suffices as a general indicator of religiosity.

Results

In Figure 2, the order of values as determined by CIRCUS software is presented. The order of the Values approximates Schwartz's structure. One exception is that Conformity and Tradition are not at the same place (Figure 1), but the suggested circle is exactly the same as the circular order applied by Schwartz & Huismans (1995). The distribution of Value Circle Scores is reported in Figure 3. It appears that all possible scores are used up to a certain degree. Score 0, the position between Security and Power, is infrequent ($f = 3$, only). It was possible to assign scores to 246 (92%) of the 268 students, as for the remaining participants scores were inadmissible.

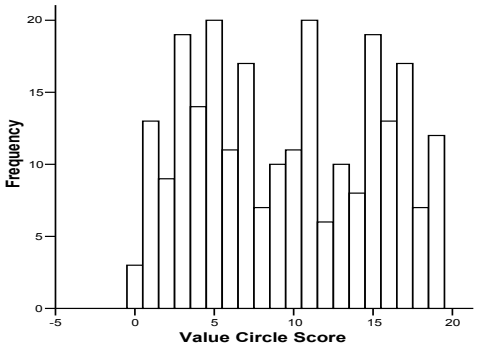


Figure 3. Distribution of the Value Circle Scores.

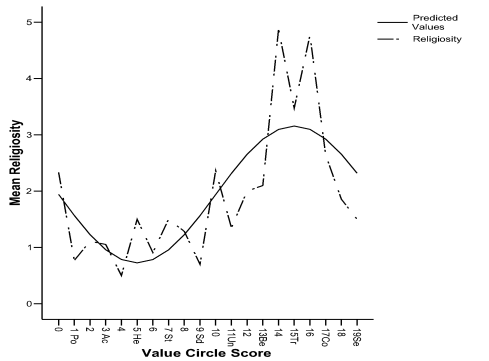


Figure 4. The relation between Value Circle Scores and religiosity.

Figure 4 shows that the expected relation between Value Domains and Religiosity is found in our data. Religiosity is primarily related in a positive way with Tradition Values and negatively with Hedonism Values. The form of the relation is a sinusoid. Using the Value Circle Scores we are in a position to test the hypothesis statistically using Nonlinear Regression by testing for the model:

$$\mathrm{E}(Religiosity) = a + \quad b \quad \sin \frac{(Value \quad Circle \quad Score \quad c)}{20} \quad 2\neq$$

with parameters *a*, *b* and *c*.

Notes:

- **a.** The basic part of the model is the sinus taken from the Value Circle score multiplied by 2π to translate the circle scores to radians. This score is divided by the scaling factor 20.
- **b.** Parameter '*a*' defines the height of the curve, the baseline for the sinus curve.
- **c.** Parameter '*b*' defines the width of the curve, and
- **d.** Parameter '*c*' defines the starting point.

R^2 for the model, was .18 with $F_{2,242} = 26.4$, $p<.01$. From Figure 4 it can be inferred that the fit of the model would be improved if the distances from 13 to 0 would be enlarged. In principle, this is possible because the Value Circle scores are measured at ordinal level. We will return to this point in the discussion section.

Discussion

The Schwartz Value Circle implies the possibility to summarize important information concerning a person's Value System in one Value Circle score. We have suggested a possible operationalization for this Value Circle score using the ideas of unfolding and nonmetric scaling. In this chapter we have shown that the so defined score is related to Religiosity in the expected way. Using the Value Circle scores we were able to test the expected sinusoid curve statistically. The Value Circle scores are defined on ordinal measurement level. The results have shown that the accuracy in describing the relation between Religiosity and the Value Circle score might be

improved if we would change the metric location of the Value Domains around the circle. Some distances between the locations on the Value circle might be enlarged. But for the moment we have no sound basis to do so. Possibly the accuracy of descriptions might be improved if we used even more reliable indicators of Religiosity and Value Domains. Furthermore, we might consider not only the direction of the deviations of Value Domain scores from the mean but also their size. But this also requires a more precise insight in circular structures than we have now.

It is encouraging to note that the Value Circle found by CIRCUS software was in principle the same as Schwartz's Value Circle, despite the fact that totally different procedures were found to construct the circle. Encouraging is also that we were able to assign Value Circle scores to the large majority of our respondents (92%). The remaining minority of the unscored profiles deserves further investigation. What does it mean that respondents have deviations at opposite locations of the Value Circle? What does it mean that respondents have value profiles with only zeros or ones.

Because Schwartz (1992) was able to show that his Value Circle was cross culturally valid, our scores have the advantage that they are interpretable across cultures. For example a Value Circle Score of '5' tells us that those people assign relatively high importance to Value Domains with Hedonism as a centre. The score gives insight in the relative importance people assign to certain Value Domains regarding their own cultural group. This interpretation is valid in every culture where we can show that the Value Circle describes the relations between Values.

Furthermore, we may expect that the proposed Value Circle score is immune to response tendencies like acquiescence and social desirability. People rating high on these tendencies will get a large number of ones in their profiles. But the number of ones is irrelevant to their position on the circle as long as not all Value Domains are scored with a "1". So a respondent with a tendency to answer positively can get the same place on the circumference of the circle as a respondent who is free of this tendency. The same might be true for social desirable answering. Schwartz et al. (1997) have shown that value ratings are more influenced by substantive considerations than by the tendency to respond social desirably. We believe that the Value Circle scores are even less vulnerable for social desirable responding. As long as respondents give the highest ratings to values that really matter for them, their place on the Value Circle can be inferred.

We believe that this study might contribute in solving the issue of ranking versus rating of values. Our proposal is a combination of the two methods. Schwartz (1992) has shown the advantage of using rating scores to assess the importance people give to values to find his Value Circle. But in this study, using the same ratings, two kinds of relative importance are introduced in the scores. Firstly we did not use the absolute rating but we analyzed the degree the ratings deviated from the mean ratings in the sample. Secondly to locate a respondent on the Value Circle we used the whole profile with all the ten Value Domains. It might be that a (possibly improved) Value Circle score contains the crucial information concerning a person's Value system because it uses information (1) of a person's culture (2) the existence of the Value Circle, and (3) information concerning the whole value system of the person.

References

Coombs, C.H. (1964). *A Theory of Data.* New York: Wiley.

Huismans, S. E., & Van Schuur, W. H. (2003). The meaning of the circular structure of human values. In S. Levy & D. Elizur (Eds.), *Facet Theory. Towards a cumulative science (*pp. 49-59). Ljubljana: Faculty of Arts, Center of Educ. Dev., University of Ljubljana.

Guttman, L. (1961). A general nonmetric technique for finding the smallest coordinate space for a configuration of points. *Psychometrica, 33*, 469-506.

Leeferink, A.J. (1997). *A nonmetric circumplex model for dichotomous data. The circumplex as a nonmetric IRT Model for latent variable analysis*. Unpublished M.Sc. thesis. Groningen: Department of Sociology.

Lingoes, J. C., (1981). Testing regional hypotheses in multidimensional scaling. In I. Borg (Ed.), *Multidimensional data representations: When and why* (pp. 280-310). Ann Arbor: Mathesis Press.

Mokken, R. J. (1971). *A theory and procedure of scale analysis. With applications in political research*. New York, Berlin: Walter De Gruyter, Mouton.

Mokken, R. J., Van Schuur, W. H. & Leeferink, A. J. (2001). The circles of our minds: a nonparametric IRT model for the circumplex. In A. Boomsma, M. A. J. Van Duijn, & T. A. B. Snijders (Eds.), *Essays in Item Response Theory. Lecture notes in Statistics* (Vol. 157, pp. 339-356). New York: Springer,

Rokeach, M. (1973). *The Nature of Human Values*. New York: The Free Press.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 25, pp. 1-65). San Diego/London: Academic Press,

Schwartz, S. H., & Huismans, S. E. (1995). Value priorities and religiosity in four western religions. *Social Psychology Quarterly, 58*, 88-107.

Schwartz, S. H., Verkasalö, M., Antonowsky, A., & Sagiv, L. (1997). Value priorities and social desirability : Much substance, some style. *British Journal of Social Psychology, 36*, 3-18.

Sidiropoulou-Dimakakou, D., Mylonas, K., & Argyropoulou, K. (2008). Holland's Hexagonal Personality Model for a Sample of Greek University Students. *International Journal of Educational and Vocational Guidance, 8*, 111-125.

Tracey, T. J. G. (2000). Analysis of circumplex models. In H. E. A. Tinsley & S. D. Brown (Eds.), *Handbook of applied multivariate statistics and mathematical modeling* (pp. 641-664). San Diego: Academic.

Van Schuur, W. H. (1984). *Structure in political beliefs. A new model for stochastic unfolding with application to European party activists*. Amsterdam: CT Press.

Van Schuur, W. H. (1993). Nonparametric unfolding models for multicategory scaling data. *Political Analysis, 4*, 41-74.

Vernon, P. E. & Allport, G. W. (1931). A test for personal values. *Journal of Abnormal and Social Psychology, 26*, 231-251.